

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/25657

A. CLASSIFICATION OF SUBJECT MATTER		
IPC(7) : H02K 21/12, 21/00, 1/12, 1/00, 1/18		
US CL : 310/156, 152, 261, 264, 265, 216, 217, 218		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
U.S. : 310/156, 152, 261, 264, 265, 216, 217, 218		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
NONE		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
NONE		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,204,572 A [FERREIRA] 20 APRIL 1993 (20.04.1993),	1-5, 7-12
---	FIGURES 3 AND 5.	----
A		6,13,16
Y	US 5,829,120 A [UCHIDA ET AL.] 03 NOVEMBER 1998 (03.11.1998), FIGURES 1-23.	14, 15, 17
Y	US 5,378,953 A [UCHIDA ET AL.] 03 JANUARY 1995 (03.01.1995), FIGURES 1-5.	14, 15, 17
Y	US 5,452,590 A [VIGILI] 26 SEPTEMBER 1995 (26.09.1995), FIGURES 3-6.	14, 15, 17
Y	US 5,641,276 A [HEIDELBERG ET AL.] 24 JUNE 1997 (24.06.1997), FIGURES 1-6.	1-5, 7-12, 17
Y	US 5,004,944 A [FISHER] 02 APRIL 1991 (02.04.1991),	6, 13
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search	Date of mailing of the international search report	
01 NOVEMBER 2000	22 JAN 2001	
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer DANG DINH LE	
Facsimile No. (703) 305-3230	Telephone No. (703) 308-1782	

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 06 August 2001 (06.08.01)	
International application No. PCT/US00/25657	Applicant's or agent's file reference ECC10199
International filing date (day/month/year) 19 September 2000 (19.09.00)	Priority date (day/month/year) 20 September 1999 (20.09.99)
Applicant IFRIM, Costin	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 05 April 2001 (05.04.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Zakaria EL KHODARY Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 27 DEC 2001

WIPO PCT

Applicant's or agent's file reference ECC10199	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/25657	International filing date (day/month/year) 19 SEPTEMBER 2000	Priority date (day/month/year) 20 SEPTEMBER 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): H02K 21/12 and US Cl.: 310/156		
Applicant ECOAIR CORP.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets.
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 05 APRIL 2001	Date of completion of this report 12 NOVEMBER 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer DANG LE
Facsimile No. (703) 305-3230	Telephone No. (703) 308-1782 <i>Renee Panta</i>

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/25657

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed☒ the description:

pages _____ (See Attached)

, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the claims:

pages _____ (See Attached)

, as originally filed

pages _____, as amended (together with any statement) under Article 19

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the drawings:

pages _____ (See Attached)

, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the sequence listing part of the description:

pages _____ (See Attached)

, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☒ The amendments have resulted in the cancellation of:☒ the description, pages _____ NONE☒ the claims, Nos. _____ NONE☒ the drawings, sheets/fig _____ NONE5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/25657

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)

Claims 1-17 YESClaims NONE NO

Inventive Step (IS)

Claims 1-17 YESClaims NONE NO

Industrial Applicability (IA)

Claims 1-17 YESClaims NONE NO

2. citations and explanations (Rule 70.7)

Claims 1-17 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a rotor being configured without retaining member attached to the rotor perimeter to retain the permanent magnets and independent poles in place.

----- NEW CITATIONS -----

NONE

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/25657

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

I. BASIS OF REPORT:

This report has been drawn on the basis of the description,
page(s) 1-10, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the claims,
page(s) NONE, as originally filed.
page(s) NONE, as amended under Article 19.
page(s) NONE, filed with the demand.
and additional amendments:
Pages 11-15, filed with the letter of 17 August 2001.

This report has been drawn on the basis of the drawings,
page(s) 1-4, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
Pages 5-6, filed with the letter of 17 August 2001.

This report has been drawn on the basis of the sequence listing part of the description:
page(s) NONE, as originally filed.
pages(s) NONE, filed with the demand.
and additional amendments:
NONE

CLAIMS

1. A rotor for an electric machine, comprising a plurality of independent poles and permanent magnets circumferentially arranged in an alternating configuration such that each permanent magnet is positioned intermediate a pair of consecutive independent poles, the arrangement of the permanent magnets and independent poles defining an outer rotor perimeter and a central opening for receiving a shaft upon which the rotor rotates, each independent pole having a generally triangular cross-section that defines an apex portion that confronts the central opening and an end portion that forms a portion of the outer rotor perimeter, each permanent magnet having a reverse trapezoidal cross-section, a first end for confronting the central opening, and a second end that forms a portion of the outer rotor perimeter, each permanent magnet tapering from the first end to the second end, whereby the centrifugal force produced by rotation of the rotor radially pushes each permanent magnet away from the central opening and whereby the centrifugal force cooperates with the shape of the independent poles and permanent magnets to further improve the integrity of the lodgment of each permanent magnet between the corresponding pair of consecutive independent poles.

2. The rotor according to claim 1 further comprising a pair of hubs, the permanent magnets and independent poles being positioned between the hubs, the independent poles being attached to the hubs in such a manner that there is no interconnection between the apex portions of the independent poles so as to induce magnetization

having a direction that is substantially orthogonal to the radius of the rotor.

3. The rotor according to claim 1 wherein the end portion of each independent pole defines a pair of lips that conforms to the locally defined curvature of the outer rotor perimeter, each lip abutting a corresponding permanent magnet.

4. The rotor magnet rotor according to claim 1 wherein each independent pole has an axially extending bore sized for receiving a holding bolt.

5. The permanent magnet rotor according to claim 4 wherein the independent poles and holding bolts are fabricated from relatively high magnetic permeable materials.

6. The permanent magnet rotor according to claim 1 wherein each magnet is formed from a magnetic material chosen from ferrite, neodymium, ceramic and samarium-cobalt.

7. The permanent magnet rotor according to claim 1 wherein the independent poles are separated by a space that has a shape that conforms to the shape of a corresponding permanent magnet that is positioned within the space.

8. An independent pole for use in a permanent magnet rotor having a central opening for receiving a shaft upon which the rotor rotates, an outer rotor perimeter, and at least two permanent magnets, the independent pole having a generally triangular cross-

section that defines an apex portion that confronts the central opening and an end portion that forms a portion of the outer rotor perimeter.

9. The independent pole according to claim 8 wherein the end portion of each independent pole defines a pair of lips that conforms to the locally defined curvature of the outer rotor perimeter, each lip abutting a corresponding permanent magnet.

10. The independent pole according to claim 8 wherein each independent pole has an axially extending bore sized for receiving a holding bolt.

11. The independent pole according to claim 8 wherein each independent pole is fabricated from relatively high magnetic permeable materials.

12. A permanent magnet configured for placement between of a pair of consecutive independent poles of a rotor wherein each independent pole has a generally triangular cross-section and the rotor has a central opening for receiving a shaft upon which the rotor rotates and an outer rotor perimeter, the permanent magnet having a reverse trapezoidal cross-section, a first end for confronting the central opening, and a second end that forms a portion of the outer rotor perimeter, the permanent magnet tapering from the first end to the second end.

13. The permanent magnet according to claim 12 wherein the permanent magnet is formed from a magnetic material chosen from ferrite, neodymium, ceramic and

samarium-cobalt.

14. A rotor for an electric machine, comprising at least two independent poles and at least two permanent magnets arranged in an alternating configuration such that each permanent magnet is positioned intermediate a pair of consecutive independent poles, the arrangement of the permanent magnets and independent poles defining an outer rotor perimeter and a central opening for receiving a shaft upon which the rotor rotates, each independent pole having a first end portion that confronts the central opening and a second end portion that forms a portion of the outer rotor perimeter, the second end portion of each independent pole having a pair of lips that conform to the locally defined curvature of the outer rotor perimeter, each permanent magnet having a first end for confronting the central opening and a second end that forms a portion of the outer rotor perimeter, each lip of the second end portion of each independent pole abutting a portion of the second end of a corresponding permanent magnet, whereby the centrifugal force produced by rotation of the rotor radially pushes each permanent magnet away from the central opening and whereby the centrifugal force cooperates with the independent poles and permanent magnets to further improve the integrity of the lodgment of each permanent magnet between the corresponding pair of independent poles.

15. The permanent magnet rotor according to claim 14 wherein each pair of consecutive independent poles are separated by a space that has a shape that conforms to the shape of a corresponding permanent magnet that is positioned within the space.

16. The permanent magnet rotor according to claim 15 wherein each permanent magnet has a reverse trapezoidal cross-section.

17. The permanent magnet rotor according to claim 15 wherein each permanent magnet has a generally rectangular cross-section.

5/6

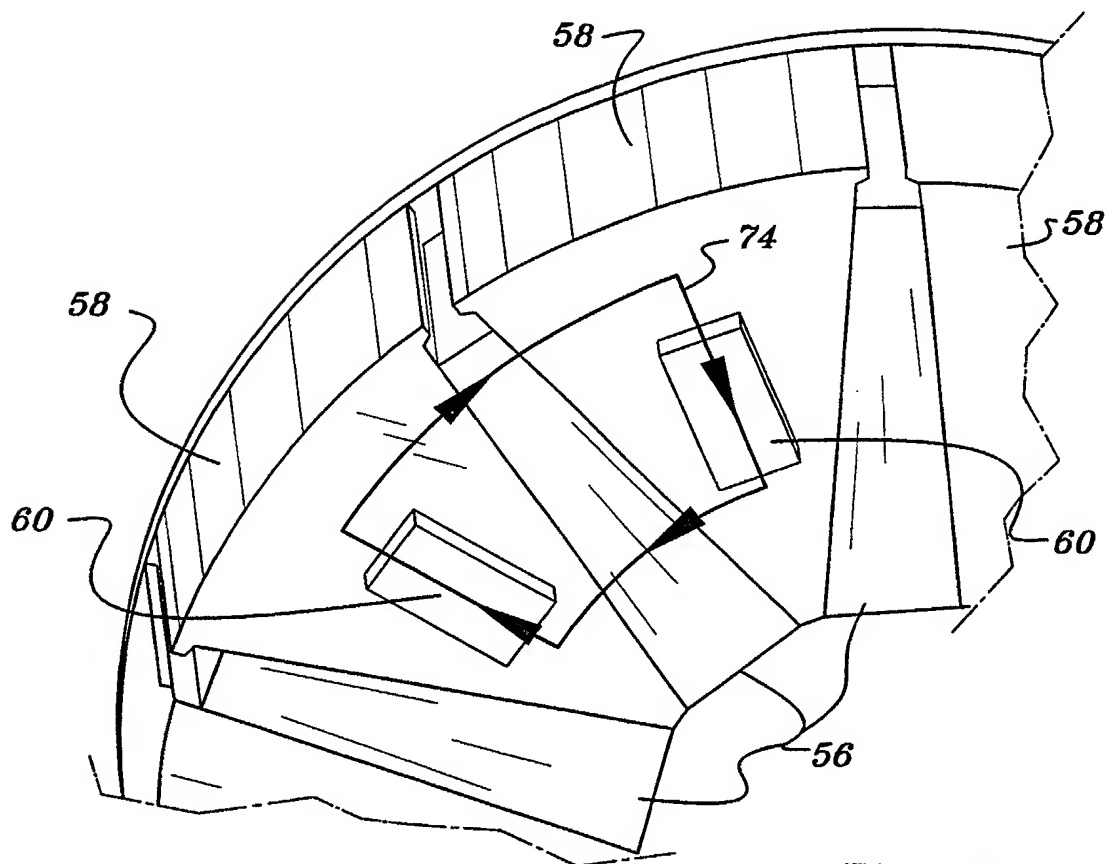


Fig. 9

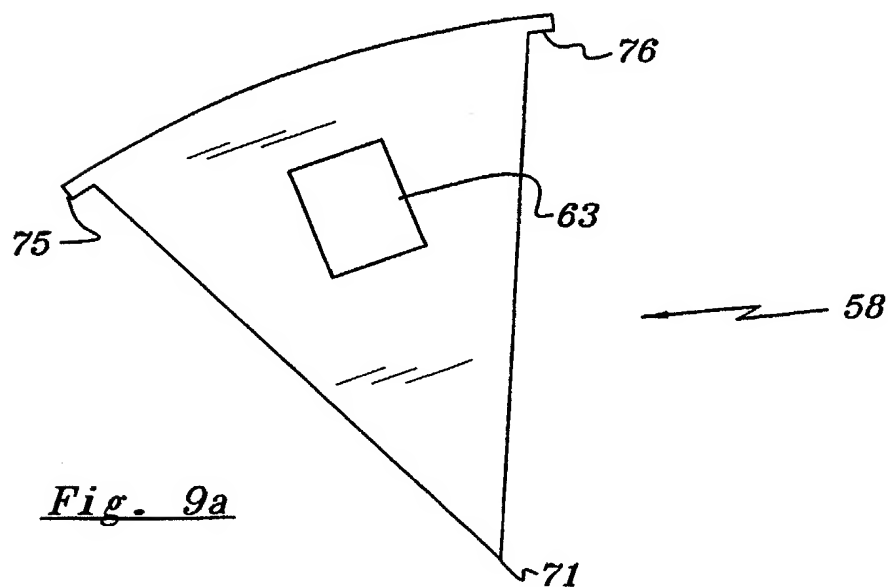


Fig. 9a

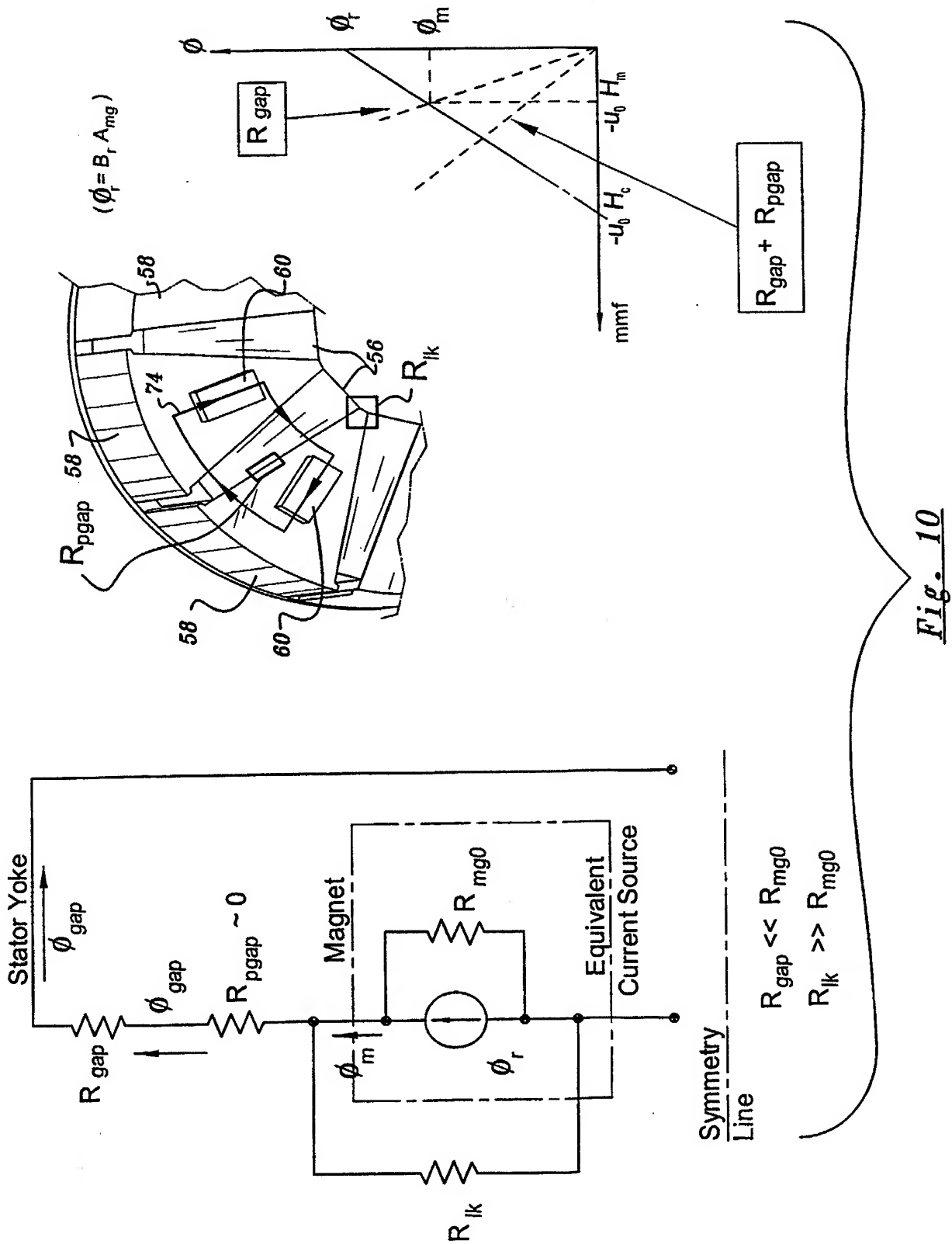


Fig. 10